

Interactive animated storytelling in presenting intangible cultural heritage

Merisa Huseinovic* and Razija Turcinhodzic†

Supervised by: Dr. Selma Rizvic‡

Faculty of Electrical Engineering
University of Sarajevo
Sarajevo / Bosnia and Herzegovina

Abstract

Isa bey tekke does not exist any more in Sarajevo. This valuable cultural heritage object was completely destroyed and a gasoline station was built in its place. Virtual reconstruction has recovered the appearance of the building, but not what was happening inside. The Mevlevi dervish ritual was presented using interactive computer animation. The goal of this paper is to explore the perception of the user who is placed in the middle of the ritual, with dervishes twirling around, enabling him/her to discover the details following the interactive story structure.

Keywords: Interactive digital storytelling, computer animation, intangible cultural heritage, virtual cultural heritage.

1 Introduction

The use of digital storytelling is becoming very popular in virtual cultural heritage applications. Many virtual reconstructions of cultural heritage sites are accompanied with stories about events and characters related to those sites. Virtual museums are also incorporating digital storytelling in both virtual and enhanced physical collections [15].

Scientific research involved in these applications is looking for the most appropriate form of digital storytelling. They vary from simple text, virtual and real guides/storytellers [1, 18], audio narration, movies to interactive forms such as serious games.

Our research is focused on story-guided virtual cultural-heritage environments. We have introduced a story for guiding the user through the virtual museum, providing him/her the context and background of virtual exhibits [3, 17]. In this paper we introduce the concept of interactive computer animation for presenting intangible cultural heritage, such as legends, tales, poems, rituals, dances, customs etc. The concept is evaluated on the case study presenting the religious ritual Sema, used to be per-

formed in Isa bey tekke in Sarajevo from 15th till 20th century.

The paper is organized as follows: Section 2 gives a short overview of the related work in similar projects, in Section 3 we describe the concept of interactive animated storytelling. In Section 4 we describe the case study. In Section 5 we present the results of user evaluation. In Section 6 we present conclusions based on our experience from this project and some directions for our future work.

2 Related work

The interactive storytelling is an effective way to present large amount of information to a general audience. It is especially useful for museums. The idea of using an avatar as a personal guide and storyteller for each visitor is considered as improvement of an interactive story [8]. The avatar's speech and animation is synchronised with synthetic voice that can be easily updated. The avatar can be incorporated into the environment and its appearance can enhance the effect of the interactive story, but the sound of its voice could be a less enhancing effect comparing to the voice of a professional human narrator. Using synthesized voice in this work would influence users' perception. There is a great probability that the mysticism created with spiritual music and special designed parts of the environment would loose its strength. Therefore we decided to use the softer sound of human voice. Improvements for this work could be done by allowing the user to become a dervish at certain parts of the storytelling.

There are many examples of interactive storytelling and just a few of them are mentioned here. An important question is what sort of abilities people need to enjoy storytelling [11]. There are three abilities that have to be influenced positively in order to have a great and successful story: focus, empathy and imagination. Creators of games, movies and virtual realities have them in mind when creating the story. Main characteristics of interactive storytelling are: unlimited freedom, various goals, originality and variety of the story lines, deeper immersion. This is a promising technology for the future. The area in which it is applied (movies, games, virtual reality) makes different

*mh14944@etf.unsa.ba

†rturcinhodzic@etf.unsa.ba

‡srizvic@etf.unsa.ba

things important, but there is still a lot to do in this field.

The research project Virtual Heritage Tours: Developing Interactive Narrative-Based Environments for Historical Sites is about Nottingham's cultural heritage [10]. Users can choose the road they will take and they feel like being a part of the examined environment and not just a passive audience. They can move around, view the action and sometimes interact with it. The story is not linear but narrative coherence still exists. The narratives are triggered as users approach an object. In our case study we activate stories on mouse click. We believe it is better as it allows users to explore objects and space without any unwanted interruptions. On the other hand, it would be hard in this case to allow user to choose the road to follow. A lot of additional work should be done to make this possible. It should be taken into consideration that the presented object is not known to the majority of audience in the Europe, and stronger guiding is necessary for less familiar subjects.

In [7] a virtual environment was created from Giotto's scene "The Rule Confirmation". This scene is presented in 3D. Characters in the scene are mapped by original Giotto's fresco models. In this project, two virtual reality installations have been realized. In the first a visitor can virtually enter into the Giotto's Fresco. The characters are animated and shown while performing the actions painted by Giotto. The main goal is to involve the visitors in the 3D scene.

In the second installation the user is able to interact inside the 3D scene, changing the view point in real time. User can also compare directly the 3D scene and the 2D image by Giotto.

When there is no visitor in the room a simple animation shows Giotto's fresco in 2D with its translation in 3D. Then a short movie starts; when it ends the 3D scene becomes animated. Visitors are able to interact inside the virtual space by moving in the real space without any interface like mouse, joystick, etc; The motion capture technology is used for this purpose: there is an infrared video camera placed on the ceiling, which frames the interactive space, identifies the first user who enters and keeps track of user's position while being inside the area covered by the camera.

Contentwise, this work is the closest to our work of all three mentioned here. Natural movements through the space are definitely a better option than using navigation, but it also needs more equipment to be realized. It would be good for this work, as well as for Giotto's fresco, if the user could actually become one of the characters on the scene.

3 Interactive animated storytelling

Glassner defines interactive storytelling as a two-way experience [2], where "the audience member actually affects the story itself". Manovich also introduces the possibility for audience to change the story and offers the concept of

an interactive narrative as "a sum of multiple trajectories through a database" [12].

The proposed concepts are suitable for the story with a classical dramatic structure, containing catalytic problem, climax and resolution. In case of a story that has informative character, such as in documentary forms, we propose to implement interactivity by dividing the story in parts and enabling the user to activate them according to his interest or sensibility.

In our concept the story consists of the main story and substories. The main story is a sequential narrative about the dervish religious ritual. It is divided in logical parts as the ritual is developing. Substories present some objects in the ritual room semahana or participants in the ritual in more detail. They are activated on mouse click by the user from the moment of the first mention of the particular object or character until the end of the main story. In any moment the user can activate the story map and navigate directly to some chosen part of the main story or a substory.

Virtual reconstruction of this ritual was first implemented as computer animation rendered in a movie. Then we decided to implement the interactive form of that computer animation and virtually place the user in the middle of the ritual.

We were interested how the user will feel in that situation and to compare it with the perception of the movie. Results of the user immersion level will show if intangible heritage could be more efficiently presented using interactive rather than non-interactive storytelling form.

4 Case study

Tekke (tekija) is the place where Dervishes gather and perform religious ceremonies. Tekke buildings were built as a part of natural surroundings and were completely open towards its ambience. Very often attributes of locations chosen for the tekkes are: a river, a cliff, a canyon, a hill, etc. In Bosnia and Herzegovina, tekke buildings appear in 15th century. Isa-bey's tekke (Figure 1) of the Mevlevi order is the first tekke in Bosnia and Herzegovina and was built by Isa-bey Ishakovic in 1461, at Bentbasa near Sarajevo.



Figure 1: Isa-bey tekke [16]

The Isa-bey's tekke was occasionally destroyed by fires and floods, but was rebuilt after each disaster. In 1957 it was demolished for the last time, and the burial ground was destroyed. The destruction of the tekke was finalised by construction of the road and petrol station on the location of the site [16]. The natural and architectural ensemble of the Isa-bey's Tekke in Sarajevo is designated as a National Monument of Bosnia and Herzegovina in March 2005.

The virtual reconstruction of Isa-bey's Tekke was implemented through a graduate project at the Computer Science Department of the Faculty of Electrical Engineering in Sarajevo (Figure 2). Exterior object model and two interior rooms have been created.



Figure 2: 3D model created in 3DS Max [16]



Figure 3: Storyboard

The project has successfully introduced the public with the cultural heritage object that does not exist any more [4], but it still remained unknown what was going on

inside the object. Therefore we have undertaken the development of the second phase of the project, a digital story about the zikr ceremony inside the Isa-bey's tekke, and in the third phase we made it interactive.

4.1 Virtual presentation of dervish ritual (zikr)

The Mevlevi order is one of the most well-known of the Sufi orders. It was founded in Konya by Rumi's followers after his death. The Mevleviye are known for their famous Sema ritual, that, as they say, "represents a mystical journey of man's spiritual ascent through mind and love to "Perfect". Turning towards the truth, his growth through love, he deserts his ego, finds the truth and arrives to the "Perfect", then he returns from this spiritual journey as a man who reached maturity and a greater perfection, so as to love and to be of service to the whole of creation, to all creatures without discrimination of believes, races, classes and nations" [6].



Figure 4: 3D model of dervish and tennir [14]



Figure 5: 3D model of ney b) 3D model of kudum [14]

The ritual takes place in Semahana and consists of seven parts. The digital storytelling process was implemented through the following phases: research and collecting of materials, writing the scenario, scenario visualisation with storyboards, modeling objects, textures creating and mapping, skinning, character animation, modeling clothes, clothes simulation, scenes illumination, cameras positioning, rendering the final movie in 3ds max, recording the narration, importing the movie and narration into Windows Movie Maker and finalizing digital story.

A storyboard is used to describe each scene as a unique sequence of pictures. Figure 3 presents the storyboard of our digital story.

The models of characters are created in 3DS Max and the biped construction was used for character animation.

Some of the models and clothes are presented in Figures 4, 5, 6 and 7.

After rendering the animation in 3ds max we created a movie sequence and performed audio mix with narration and postproduction.



Figure 6: 3D model of Quran [14]

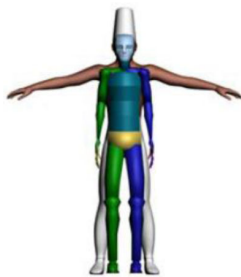


Figure 7: Character model and biped [14]

4.2 Interactive computer animation

The third phase of the project was to create interactive computer animation based on digital story described in Section 4.1.

An example of created model is shown in Figure 8.

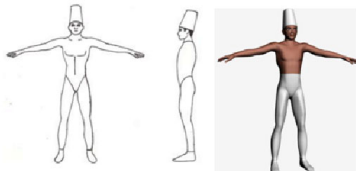


Figure 8: Sketch and final model of dervishes body created in 3DS Max [14]

Skeletal animation was used for realistic animation of characters. After modeling, all models are imported into Unity. The Unity game authoring tool was chosen for its portability with 3ds max software. We encountered a problem that vertex animation is not officially supported by Unity yet, so it is not possible to import vertex animations or morph targets directly from 3DS Max. It could be done using scripting in Unity. Due to the lack of time and lack of experience in scripting, some parts of the digital story are not interactive.

To have a playable file in Unity it was necessary to add scripts and attach them to objects. The Java scripts are written in MonoDevelop integrated development environment (Figure 9).

Figure 10 shows a dervish with attached script.

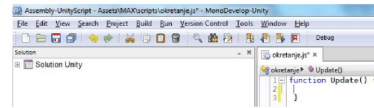


Figure 9: MonoDevelop IDE

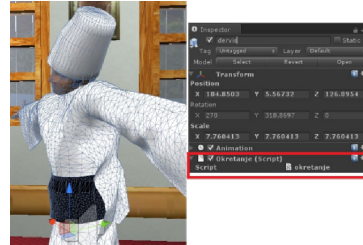


Figure 10: The script attached to an object

Our goal was to place the user inside the digital story about zikr ritual. Users can move within the Semahana (the room where the ritual is performed, Figure 11), among dervishes and static objects.



Figure 11: Semahana in Unity 3D

The Sema ceremony is divided in the main story and substories. The main story is divided in parts playing sequentially one after another. Some objects related to the story are described in more detail through substories, activated when the user clicks on the object in question, marked by red color. After a substory is finished, the user is back to the current location in the main story. The structure of the interactive story is presented using the site map (Figure 14).

The 3DS Max animation files have been imported in the Unity 3D together with narration and video files. Interactive digital story opens after the short intro. Its parts are opening automatically one after another. The clickable object in the scene becomes red when the mouse is over it (Figure 12). When the user clicks on the object, the sub-story about that object is being played (Figure 13).

After the substory is finished, the user is back to the same place in the main story. The visitor can open the Site map anytime and directly choose the part of the story which he/she wants to explore.



Figure 12: One of the clickable objects - mihrab



Figure 13: Substory about mihrab

The Unity virtual environment is exported into executable file for interactive use [13].

5 User evaluation

The user evaluation of the project was conducted using questionnaires and interviews. The study included 20 participants. This number was considered satisfactory for the qualitative analysis methodology, as the practice has shown that 7 users will find approximately 80% of problems of an interface [5]. Lazar et al state in [9] "In some cases, statistical techniques can be used to determine the minimum number of subjects necessary for a result of a given significance. Usually, you want at least 15-20 participants: smaller studies may miss potentially interesting results."

Some of participants received the materials and the questions over e-mail. They were asked to view the materials and to answer questions afterwards. Other participants had an interview after they went through the materials, which opened the possibility to discuss parts of the presented work in more details.

5.1 Experiment design

The materials viewed by the participants were divided into three categories. The first category included only the movie, the second category included only the interactive computer animation and the third category included both.



Figure 14: The site map

Five people were involved in the first and second category and ten people in the third category.

There were no specific conditions set by choosing the participants related to the age, nationality or profession. The participants have the average age of 36. Four participants reported seeing problems and none of them reported hearing problems. Eight of them are not experienced computer users.

5.2 Qualitative data analysis

The evaluation is performed using qualitative methods. Conversion of qualitative data into quantitative form is done by the process of data coding. Coding extracts values for quantitative variables from qualitative data (interviews and questionnaires) to perform quantitative or statistical analysis [5]. The process of coding does not affect data subjectivity or objectivity.

It is often not easy to quantify qualitative information. The researcher has to examine carefully the words and the meanings of the subject to code the data as accurate as possible.

Coded questions are represented in tables below. Table 1 presents questions used in all three categories. Questions from Table 2 (excluding E2) were used for the second and third category.

Based on the research question we need to answer

Question	Code	Possible value	Answer
Have you heard of Isa Bey tekke?	I1	yes no	15 5
Do you know what is a tekke?	I2	yes no	18 2
Which order of dervishes gathered in this tekke?	I3	right wrong	16 4
Did you feel like you were in a tekke?	E1	yes no	15 5

Table 1: Category 1 questions

Question	Code	Possible value	Answer
Have you had problems with navigation in the interactive environment?	N1	yes no	4 11
Have you used a site map (house in the upper left corner of the screen)?	N2	yes no	12 3
Would you be back again to look at what you missed?	N3	yes no	14 1
What is better for learning about the object? A movie or interactive form?	E2	movie inter. form equal	2 6 2

Table 2: Category 2 and 3 questions

through this user study, the following two hypotheses were formed:

- H1: Participants felt like being inside of the tekke.
- H2: Interactive animation is a better way of presentation intangible cultural heritage comparing to the movie.

Questions I1 and I2 examine participants' previous knowledge of this subject. Fifteen of them have heard of Isa Bey tekke and two of them do not know what a tekke is. Question I3 was correctly answered by 16 participants. Some of them knew it before they watched their materials, and some of them learned it from the materials.

All participants have learned something regardless of the way of the presentation. They have memorized some details from Mevlevi dervish ritual, objects from the tekke, historical facts.

Group of questions for categories 2 and 3 (N1-N3) is related to the navigation through the interactive story and returning to watch it again. Results are given in Figure 15.

Referring to the questions connected directly with H1 and H2 this study shows the following:

Only 40% of participants who watched the movie have felt like being inside of the tekke. All participants who saw the interactive animation and 70% of participants who watched both felt like being in the tekke (Figure 16).

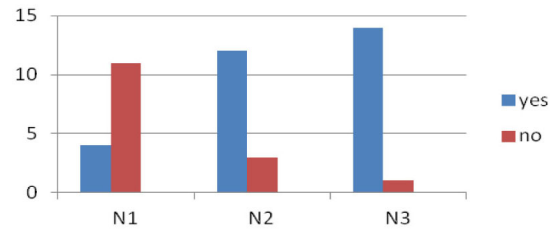


Figure 15: Navigation problems (N1), use of the site map (N2) and intention to watch again missed parts (N3)

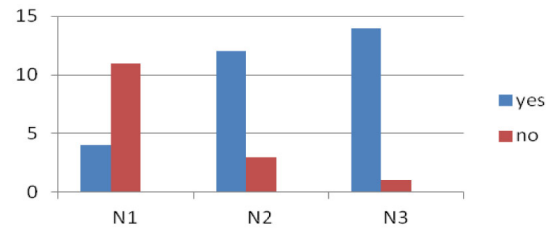


Figure 16: Feeling like being in the tekke (E1)

The results show that interactive form gives to more participants the feeling of being inside of the observed object (immersion) then the movie.

The E2 question confirms the hypothesis 2. Figure 17 shows that 60% of participants think that interactive animation is a better form to learn about an object, and 20% think that they are equal (out of 10 participants from category 3).

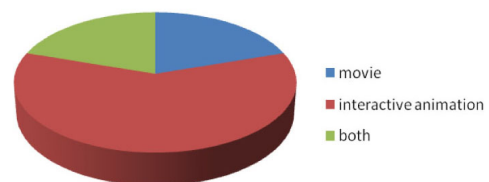


Figure 17: Preferring movie or interactive form (E2)

The participants preferred the interactive animation because (quoted from the answers):

- The participant can choose the direction of the story and can analyse models from different angles.
- The participant can focus on certain details in the environment that the shots from the movie could not show (or may be briefly shown). The interactive form gives freedom to select certain part of information the participant would like to listen to again.
- Active participation.

- By watching a movie some things can be missed and concentration can decrease. The interactive form is more interesting - it is not just watching, but the participant has to do something by himself/herself and stays focused all the time.
- It is more concrete and gives the feeling to be present in the object comparing to the movie.
- It is more interesting and enables controlled moving through the space.
- It gives the ability to feel the space that does not exist any more, enables free moving and exploring that a movie can not provide.

The participants from all categories said that they would like to have more information. Those who watched just the movie pointed out that they would prefer more music and longer presentation. Animation quality, scenography, quality of the sound and navigation were the main things that bothered the users. It is interesting that the lack of continuity (sudden jumps from one scene to another, feeling like they miss something in between, quick movements of dervishes during the dance) were bothering the participants from categories 1 (60%) and 3 (20%).

Users who watched only the interactive animation did not report anything about this. The reason is probably the freedom they had by moving through the environment and no experience with the movie. Some participants from categories 1 (40%) and 3 (20%) expected high quality animation and characterized the movements as plastic and objects as unrealistic. Category 2 and 3 users complained about navigation (too fast moving, confusion on some places) or intensity of light (40%). Participants from all categories complained about narration and sound. The reason for this probably lies in not using professional narrator and equipment. The participants from categories 2 (60%) and 3 (20%) were absolutely satisfied with materials. Additional 50% of the category 3 users complained just about navigation, light or sound.

Some users recommended to improve the navigation, the sound and to decrease the light intensity. They suggested to give additional information about the objects and ritual and to present some of it in the written form. They liked the music and would prefer to hear more of it.

Most of the participants like the idea of this project (70%). Interactivity was pointed out as the best feature by 67% (category 1 is excluded). They liked the possibility to move through the tekke and to find out more about the objects they were interested in.

6 Conclusions

Intangible cultural heritage can be efficiently presented using digital storytelling. On the example of the sema dervish ritual virtual presentation, we showed that users

feel more immersion in interactive animation than in non-interactive storytelling form (movie). The feeling of immersion is enhanced by virtual characters, participants in the ritual, twirling around the viewer. Ability to activate substories by clicking on a certain object or character from the virtual environment made the users more comfortable with the exploration of the presented ritual.

In the proposed concept the user was interacting with the flow of the story, but not with the characters. The narrator was not visible and there was no avatar representing the user. In our future work we will explore if the user feels more comfortable to also interact with the characters in the story, to see the narrator and interact with him/her and to be able to see himself as an avatar.

References

- [1] A.Sadzak S.Rizvic C.Dalton A.Chalmers. *Information Perception in Virtual Heritage Storytelling Using Animated and Real Avatars*. Spring Conference on Computer Graphics, 2007.
- [2] A.Glassner. *Interactive Storytelling: Techniques for 21st Century Fiction*. A.K. Peters, 2004.
- [3] S.Rizvic A.Sadzak V.Hulusic A.Karahasanovic. *Interactive Digital Storytelling in the Sarajevo Survival Tools Virtual Environment*. Spring Conference on Computer Graphics, Smolenice Castle, Slovakia, 2012.
- [4] S.Rizvic A.Sadzak A.Zuko. *Isa bey's Tekija in Sarajevo - reviving the reminiscence of the past*. Review of the National Center for Digitization, Faculty of Mathematics, Belgrade, Issue: 15, pg 64-72, 2009.
- [5] C.B.Seaman. *Qualitative Methods in Empirical Studies of Software Engineering*. IEEE Transactions on Software Engineering, Vol. 25, No. 4, 1999.
- [6] C.Celebi. *Sema: Human Being in the Universal Movement*. 2010, online: www.mevlana.net.
- [7] E.Pietroni F.Antinucci. *The Approval of the Franciscan Rule - Virtual Experience among the Characters of Giotto's Work*. VAST10: The 11th International Symposium on Virtual Reality, Archaeology and Intelligent Cultural Heritage, 2010.
- [8] The Ename Center for Public Archaeology and Heritage Presentation Belgium. *EPOCH Showcase 2.4.6 - Avatar-Based Interactive Storytelling*. Ename Center, 2005.
- [9] J.Lazar J.H.Feng H.Hochheiser. *Research Methods In Human-Computer Interaction*. Wiley, 2010.

- [10] D.Tuck I.Kuksa. *Virtual Heritage Tours: Developing Interactive Narrative-Based Environments for historical Sites*. Second Joint International Conference on Interactive Digital Storytelling -ICIDS, 2009.
- [11] J.Schell. *Understanding Entertainment: Story and Gameplay are One*. ACM Computers in Entertainment, Carnegie Mellon University, PA, Vol.3.1, 2005.
- [12] L.Manovich. *The Language of New Media*. 1st MIT Press pbk. ed, Cambridge, Mass, 2002.
- [13] M.Huseinovic. *Whirling Dervishes*. 2013, online:<http://h.etf.unsa.ba/unity/>.
- [14] M.Huseinovic. *Kompjuterska animacija u virtuelnoj prezentaciji kulturnog naslijeda*. Faculty of Electrical Engineering Sarajevo - Masters Thesis, 2012.
- [15] EU FP7 NoE Virtual Museum Transnational Network. *State of the art on Virtual Museums in Europe and outside Europe*. Deliverable report, 2011, online: http://www.v-must.net/sites/default/files/D2.3,%20V_Mustnet_state_art_Virtual_Museum.pdf, pg 21-22, 30.
- [16] ETF Sarajevo. *Virtual Reconstruction of Isa-begova Tekija in Sarajevo*. Museum of Sarajevo, 2008, online: <http://www.muzejsarajeva.ba/tekija/>.
- [17] S.Sljivo S.Rizvic. *Virtual Museum of Bosniak Institute*. New Technologies and Standards: Digitization of National Heritage, 11th Conference, Belgrade, Serbia, 2012.
- [18] V.Hulusic S.Rizvic. *Live virtual guides in educational applications*. IEEE VS - Games: 3rd International Conference in Games and Virtual Worlds for Serious Applications, Athens, Greece, 2011.